LISTING OF THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in this application. Added text is indicated by underlining, and deleted text is indicated by ~~strikethrough~~. Changes are identified by a vertical bar in the margin.

1. (Currently Amended) A method of in-situ measurement of optical aberrations, the method comprising:

producing an illumination source at low partial coherence and chief rays overfilling an entrance pupil;

exposing measurement fiducials of an encoded face of a reticle onto a sensing plane wherein an optical element is mounted on the reticle, wherein the illumination source and optical element cooperate to produce, at different points on the encoded face, narrow ray bundles having chief rays at angles that vary regularly as a function of position on the encoded face;

measuring relative positions of the exposed measurement fiducials on the sensing plane; and

determining the optical aberration from the measured positions and known relative positions of the measurement fiducials of the encoded face.

2. (Currently Amended) ~~A method as defined in Claim 1,~~ A method of in-situ measurement of optical aberrations, the method comprising:

producing an illumination source at low partial coherence and chief rays overfilling an entrance pupil;

exposing measurement fiducials of an encoded face of a reticle onto a sensing plane wherein an optical element is mounted on the reticle;

measuring relative positions of the exposed measurement fiducials on the sensing plane; and

determining the optical aberration from the measured positions and known relative positions of the measurement fiducials of the encoded face, wherein the optical element is a refractive lens.

3. (Currently Amended) ~~A method as defined in Claim 1,~~ A method of in-situ measurement of optical aberrations, the method comprising:

producing an illumination source at low partial coherence and chief rays overfilling an entrance pupil;

exposing measurement fiducials of an encoded face of a reticle onto a sensing plane wherein an optical element is mounted on the reticle;

measuring relative positions of the exposed measurement fiducials on the sensing plane; and

determining the optical aberration from the measured positions and known relative positions of the measurement fiducials of the encoded face, wherein the optical element is a conical lens.

4. (Currently Amended) ~~A method as defined in Claim 1,~~ A method of in-situ measurement of optical aberrations, the method comprising:

producing an illumination source at low partial coherence and chief rays overfilling an entrance pupil;

exposing measurement fiducials of an encoded face of a reticle onto a sensing plane wherein an optical element is mounted on the reticle;

measuring relative positions of the exposed measurement fiducials on the sensing plane; and

determining the optical aberration from the measured positions and known relative positions of the measurement fiducials of the encoded face, wherein the optical element is a diffractive optic.

5. (Currently Amended) ~~A method as defined in Claim 1,~~ A method of in-situ measurement of optical aberrations, the method comprising:

producing an illumination source at low partial coherence and chief rays overfilling an entrance pupil;

exposing measurement fiducials of an encoded face of a reticle onto a sensing plane wherein an optical element is mounted on the reticle;

measuring relative positions of the exposed measurement fiducials on the sensing plane; and

determining the optical aberration from the measured positions and known relative positions of the measurement fiducials of the encoded face, wherein the optical element is a compound lens.

6. (Cancelled)

7. (Original) A method as defined in Claim 1, wherein the measurement fiducials are scanner wafer alignment marks.

8. (Original) A method as defined in Claim 1, wherein the measurement fiducials are stepper wafer alignment marks.

9. (Original) A method as defined in Claim 1, wherein the measurement fiducials are square toruses.

10. (Original) A method as defined in Claim 1, wherein the measurement fiducials are crosses.

11. (Original) A method as defined in Claim 1, wherein the measurement fiducials include subresolution features to thereby produce a gradient in transmission.

12. (Original) A method as defined in Claim 1, wherein producing a light source at low partial coherence further comprises providing an illumination modifying optic.

13. (Original) A method as defined in Claim 12, wherein the illumination modifying optic is an opaque disk with a hole in it wherein the illumination modifying optic is placed at the conjugate aperture stop of a projection lithography tool.

14. (Original) A method as defined in Claim 12, wherein the Illumination modifying optic is a diffuser.

15. (Currently Amended) A method of measuring lens aberrations of a projection lens system, the method comprising:

directing a plurality of narrow light ray bundles, wherein each light ray bundle includes a chief ray, onto a plurality of locations on a reticle with a plurality of measurement fiducials encoded onto a face of the reticle, wherein the chief ray angles incident at the plurality of locations on the reticle differ;

exposing the plurality of measurement fiducials through a lens and onto a sensing plane;

measuring positions of the plurality of exposed measurement fiducials on the sensing plane; and

determining aberrations of the exposed measurement fiducials.

16. (Currently amended) A method as defined in Claim 15, wherein directing a plurality of light ray bundles further comprises:

inserting an illumination modifying optic between a light source and a condensing lens thereby forming an effective source, wherein the illumination modifying optic is located at a conjugate aperture stop of an image plane of the projection lens system,

wherein light passing through the illumination modifying optic and condensing lens forms a plurality of light ray bundles with corresponding chief rays; and

placing an optical element between the effective source and an encoded face, wherein angles of incidence of the chief rays within the respective bundles vary sufficiently to overfill a pupil of the optical element <u>and the angles of the chief rays vary regularly as a function of position on the encoded face</u>.

17. (Original) A method as defined in Claim 16, wherein the optical element is a lens.